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High Population, Narrow Row Dryland Sorghum For Southwest Kansas

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Dryland grain sorghum in southwest Kansas is usually grown in 30- to 40-inch rows at populations of 15,000 to 25,000 plants per acre. Sorghum grown in this manner usually yields very well, even in years of minimal rainfall. However, sorghum planted in wide rows at a low population results in insufficient residue after harvest to protect the soil from wind and water erosion in the subsequent fallow period. Thus, there has been interest recently in growing sorghum in narrow (10-12 inch) rows at populations as high as 75,000 plants per acre. High-population, narrow-row sorghum leaves residue evenly distributed over the soil surface and should reduce erosion. Considerable success with this method has been noted in the Hays, Kansas, area (Try Some "Super Thick" Sorghum. Keeping Up With Research No. 49 R, March 1982). Precipitation averages 23 inches annually at Hays, while at Garden City precipitation averages 18 inches. An experiment was designed to compare several populations of both narrow- and wide-row sorghum with the objective of determining if high-population, narrow-row sorghum is suitable for the Garden City area of southwest Kansas.

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Procedure

Five typical grain sorghum hybrids differing in maturity were selected. Half bloom dates ranged from 44 to 65 days. The hybrids were planted in mid-June of each year and hand thinned to populations of 25,000, 50,000, and 75,000 plants per acre in both 10- and 30-inch rows. The study consisted of both continuous sorghum and sorghum planted after a 20-month fallow period.

Results

Results from the four years of the study are presented in Tables 1 and 2. The yield of individual sorghum hybrids depended largely on subsoil moisture at planting, rainfall during the growing season, and the length of time to maturity. Subsoil moisture at planting was always greatest for fallow sorghum, with the soil moisture content near field capacity to a depth of five feet in all four years of the study. Conversely, the subsoil was only wet to a depth of two or three feet at planting for continuous sorghum. Thus, yields of continuous sorghum were below those of fallow sorghum in every year except 1977, when the amount and distribution of rainfall during the growing season was more favorable.

Maturity: Under conditions of adequate moisture the longer season hybrids yielded more than the shorter season hybrids, but when moisture was somewhat limited maturity had less effect on yield. If moisture was severely limited (as for continuous sorghum in 1979) the yields of the longer season hybrids were reduced below those of the shorter season hybrids, particularly at high populations.

Population: Yields of the two longest season hybrids of continuous sorghum were drastically reduced due to the 75,000 plant population in 1979. Reductions in other years, when they did occur, were smaller. Often slight increases in yield occurred. Fallow sorghum usually increased in yield with an increase in population, regardless of the maturity of the hybrid.

Row Width: Row width generally had no definite effect on the yield of continuous sorghum, with the exception of the two longest season hybrids in 1979, when the decrease in yield with an increase in population was greater in 10-inch than 30-inch rows. As population increased, the shorter season hybrids of fallow sorghum often yielded more in 10-inch than 30-inch rows. The effect of row width on the yield of the later hybrids on fallow was inconsistent.

Table 1. The effects of hybrid, row width, and plant population on the yield of *fallow* dryland grain sorghum. 1977-1980.

Hybrid (Days to ½ bloom)	Row Width Inches	Plant Population	Year				
			1977	1978	1979	1980	Avg.
	10	25000	(Not	51	53	70	58
	10	50000	Planted)	58	65	66	63
Northrup King MM52	10	75000		64	72	69	68
(44)	30	25000		47	56	64	56
	30	50000		50	60	64	58
	30	75000		52	60	62	58
	10	25000	34	58	58	73	56
	10	50000	39	69	71	72	63
Pioneer 894	10	75000	40	70	77	76	66
(51)	30	25000	33	62	61	71	57
	30	50000	28	64	68	71	58
	30	75000	36	70	70	70	61
	10	25000	49	68	71	79	67
	10	50000	48	79	86	84	75
NC + 55X	10	75000	57	83	97	88	81
(53)	30	25000	50	69	70	79	67
	30	50000	47	77	81	80	71
	30	75000	58	78	91	82	77
	10	25000	84	73	75	87	80
	10	50000	85	76	82	93	84
Dekalb C-42a +	10	75000	72	82	82	86	80
(58)	30	25000	69	72	78	91	77
	30	50000	78	77	81	85	80
	30	75000	83	75	89	80	82
	10	25000	76	59	69	91	74
	10	50000	82	76	75	89	81
Dekalb E-57 +	10	75000	92	75	76	93	84
(65)	30	25000	83	58	75	84	75
	30	50000	89	72	77	87	81
	30	75000	83	78	84	92	84
	LSD (.05)	Hybrid	9	12	10	6	
	Row Width		NS	8	NS	4	
	Population		11	7	7	NS	

Table 2. The effects of hybrid, row width, and plant population on the yield of *continuous* dryland grain sorghum. 1977-1980.

Hybrid	Row Width Inches	Plant Population	Year				
			1977	1978	1979	1980	Avg.
Northrup King MM52	10	25000	(Not Planted)	45	36	43	41
	10	50000		53	31	40	42
	10	75000		51	34	36	40
	30	25000		47	36	40	41
	30	50000		51	41	43	45
	30	75000		54	34	36	41
Pioneer 894	10	25000	28	56	36	45	41
	10	50000	44	62	38	44	47
	10	75000	46	60	34	44	46
	30	25000	31	52	36	43	40
	30	50000	33	54	37	43	42
	30	75000	37	60	38	42	45
NC + 55X	10	25000	44	55	33	45	44
	10	50000	57	49	35	43	46
	10	75000	57	51	30	43	45
	30	25000	43	54	41	43	45
	30	50000	56	56	45	45	50
	30	75000	52	59	37	44	48
Dekalb C-42a +	10	25000	53	51	38	45	47
	10	50000	77	58	35	40	53
	10	75000	77	52	21	39	48
	30	25000	65	48	37	43	48
	30	50000	67	58	33	46	51
	30	75000	74	56	30	42	50
Dekalb E-57 +	10	25000	64	48	21	41	44
	10	50000	77	45	16	38	44
	10	75000	76	42	10	30	39
	30	25000	73	47	25	43	47
	30	50000	79	47	27	46	50
	30	75000	82	50	14	37	46
	LSD (.05)	Hybrid	10	9	12	NS	
		Row Width	NS	NS	8	NS	
		Population	11	8	6	3	

Conclusions

If subsoil moisture and precipitation are adequate, the yield of high-population, narrow-row sorghum will equal, and often exceed, that of low-population, wide-row sorghum. When subsoil moisture and precipitation are limited yields of long-season hybrids will be reduced by high populations. Yields of long-season hybrids may be decreased further by narrow rows. Thus, caution is suggested when selecting hybrids for continuous sorghum. Maturity and population of continuous sorghum should probably not exceed 50-55 days to half bloom and 50,000 plants per acre, respectively, unless the soil is wet to a depth of five feet. Continuous sorghum hybrids with fewer days to half bloom can be safely grown at a population of 75,000 plants per acre in most years. Sorghum hybrids on fallow that reach half bloom in 55-65 days can be safely grown at populations of 50,000-75,000 plants per acre in many years, unless the fallow period has been unusually dry.

In southwest Kansas, subsoil moisture is the key to successful dryland sorghum production. Sorghum maturity and population must be selected to fit the subsoil moisture conditions at planting. Narrow rows and high plant populations may reduce yields in years of severe moisture stress. However, careful selection of hybrids of the optimum maturity will result in the proper distribution of residue after harvest for improved erosion control.

Contribution 82-492-s, Department of Agronomy.

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